



OWNER'S GUIDE

INSTALLATION GUIDE

150 watt POWER INVERTER with GAME PLATE

MODEL VDC301

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Non-Transferable Limited Consumer Warranty

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Directed Electronics, Inc. (Directed) promises to the original purchaser that the automotive video monitor and/or source unit(s) (the Product), excluding accessories, purchased and installed from a Directed authorized dealer within the ninety (90) days after purchase of the new vehicle, in which the Product is installed, is free from defects in materials or workmanship under normal use and conditions for a period of three (3) years from date of purchase or the first 36,000 miles as registered on the new vehicle's odometer reading at time of delivery of the Product for warranty service, whichever occurs first. Product purchased or installed more than ninety (90) days after the new vehicle is purchased are warranted for a period of one (1) year from date of purchase of the Product.

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Should the Product be determined defective during the applicable warranty period, the Product will be repaired or replaced with a new or comparable reconditioned part(s), at Directed's option. To obtain warranty service, the Product must be returned to a Directed authorized dealer along with proof of purchase and installation.

Note: This warranty does not cover labor costs for the removal and reinstallation of the Product. **IN ORDER FOR THIS WARRANTY TO BE VALID, YOUR PRODUCT MUST BE SHIPPED WITH PROOF OF PURCHASE AND INSTALLATION BY AN AUTHORIZED DIRECTED DEALER. ALL PRODUCTS RECEIVED BY DIRECTED FOR WARRANTY REPAIR WITHOUT PROOF OF DIRECTED DEALER INSTALLATION WILL BE DENIED.**

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tions, accidental spills or customer applied cleaners, damage due to environmental causes such as floods, airborne fallout, chemicals, salt, hail, windstorms, lightning or extreme temperatures, damage due to accidents, road hazards, fire, theft, loss or vandalism, damage due to improper connection to equipment of another manufacturer, modification of existing equipment, use of a faulty tape cartridge or cleaning of the VCR head, or Product which has been opened or tampered with for any reason or which has been damaged due to alteration or service performed by anyone other than Directed Electronics, Inc.

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Some states do not allow the exclusion or limitation of incidental or consequential damages. In such states, the exclusion or limitations of this Limited Warranty may not apply to you. This Limited Warranty gives you specific legal rights and you may have other rights which vary from state to state.

Cautions

WHEN CONNECTING DIRECTLY TO A BATTERY OR OTHER POWER SOURCE OBSERVE PROPER POLARITY.

DO NOT EXCEED THE MAXIMUM INPUT VOLTAGE 15 ± 0.3 VDC (DIRECT CURRENT).

ALWAYS DISCONNECT THE INPUT TO THE INVERTER WHEN IT IS NOT IN USE.

REGULARLY CHECK THAT THE INPUT AND OUTPUT CONNECTIONS ARE TIGHT. LOOSE CONNECTIONS CAN GENERATE HARMFUL HEAT AND/OR DAMAGE THE INVERTER OR POWER SOURCE.

IMPROPER USE OF THE DEVICE CAN CAUSE DAMAGE OR INJURY AND EVEN LOSS OF LIFE.

What's Included

- 150W Power Inverter
- (4) screws to mount Inverter
- (4) Rubber Feet
- (4) screws to mount Game Plate
- Game Plate
- Fuse ATC 10 amp
- (4) screws to mount Rubber Feet

Principle of Operation

The inverter converts power in two stages. The first stage is a DC to DC converter, which raises the low voltage DC at the inverter input to 145 volts DC. The second stage is the actual inverter stage. It converts the high voltage DC into 115 volts, 60Hz AC. The inverter stage uses advanced power MOSFET transistors in a full bridge configuration. This gives you excellent overload capability and the ability to operate tough reactive loads.

Inverter Output Waveform

The AC output waveform of the Inverter is called a "quasi-sine wave" or a "modified sine wave". It is a stepped waveform that is designed to have characteristics similar to the sine wave shape of utility power. A waveform of this type is suitable for a wide variety of applications.

The modified sine wave produced by the Inverter is designed to have a RMS (root mean square) voltage of 115 volts, the same as standard household power. Most AC voltmeters (both digital and analog) are sensitive to the average value of the waveform rather than the RMS value. They are calibrated for RMS voltage under the assumption that the waveform measured will be a pure sine wave. These meters will not read the RMS voltage of a modified sine wave correctly. They will read about 20 to 30 volts low when measuring the output of the Inverter.

For accurate measurement of the output voltage of the Inverter, a true RMS reading voltmeter such as a Fluke 87, Fluke 8060A, Beckman 4410, or Triplet 4200 must be used.

Power Source

The power source must provide between 9.5 and 15 \pm 0.3 volts DC and must be able to supply sufficient current to operate the load. The power source may be a battery or a well regulated DC power supply. As a rough guideline, divide the power consumption of the load (in watts) by 12 (the input voltage) to obtain the current (in amperes) the power source must deliver.

Example: Load is rated at 140 watts.

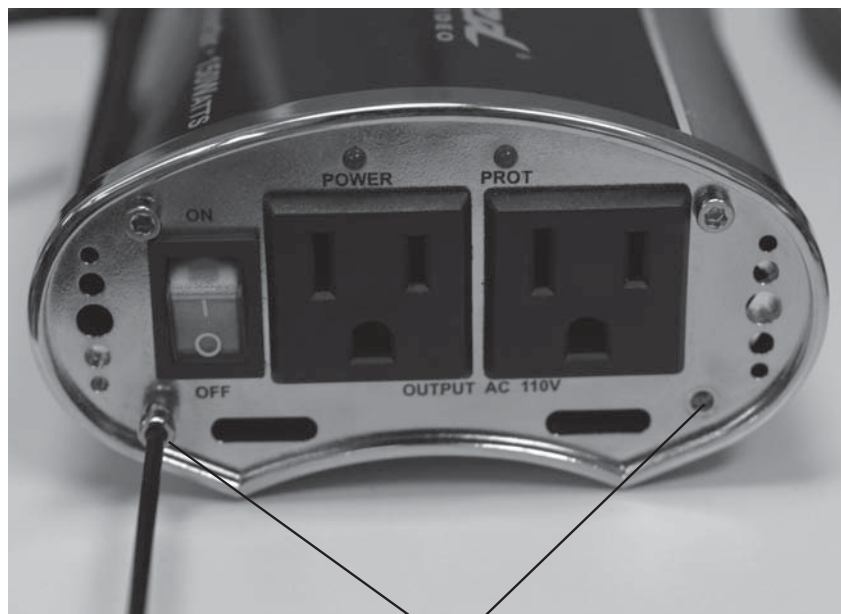
Power source must be able to deliver: $140/12= 11.66$ amperes

CAUTION: THE INVERTER MUST BE CONNECTED ONLY TO BATTERIES WITH A NOMINAL OUTPUT VOLTAGE OF 12 VOLTS. THE INVERTER WILL NOT OPERATE FROM A 6 VOLT BATTERY AND WILL BE DAMAGED IF IT IS CONNECTED TO A 24 VOLT BATTERY.

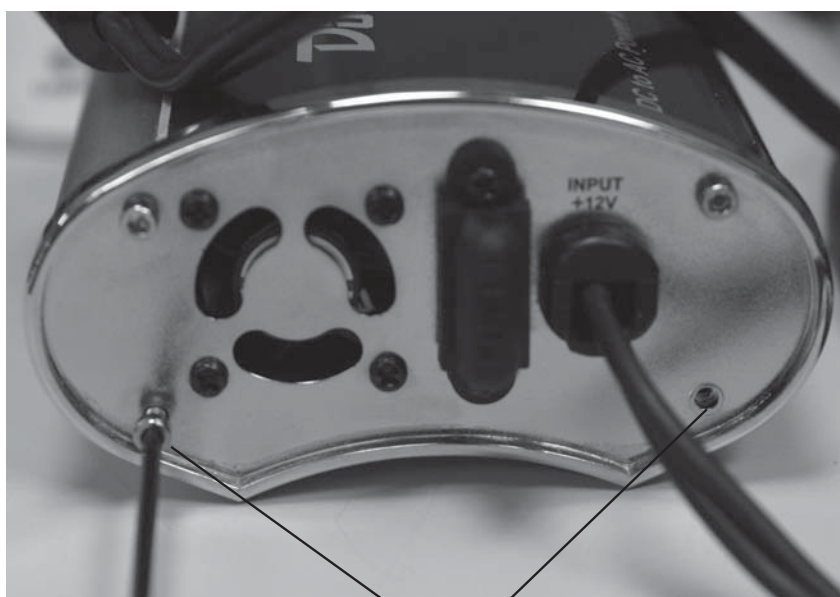
Installation of rubber mounting feet

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1. Locate plastic bag containing 4 rubber mounting feet and 4 new screws. Remove from bag.
2. Remove bottom most end cap screws from inverter housing, 2 from each side. See pictures for reference. Discard old screws.

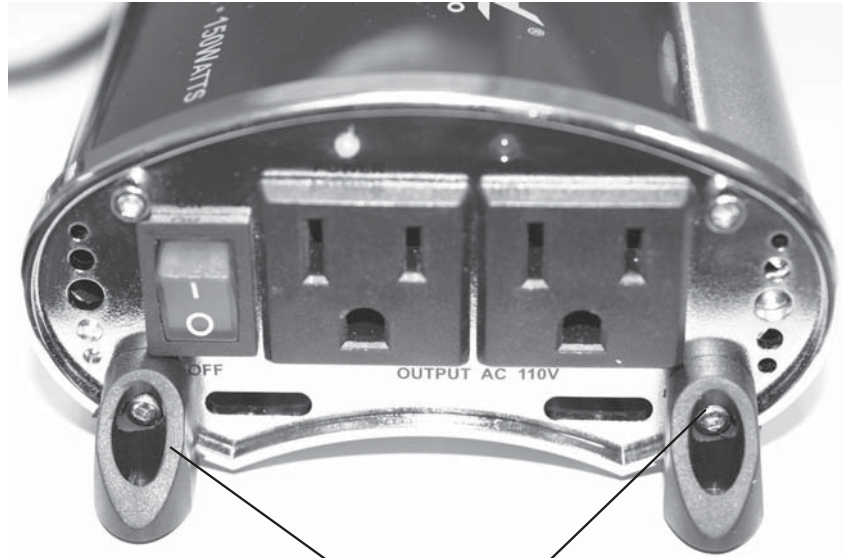


Remove both these screws



Remove both these screws

3. Attach rubber feet to inverter housing end caps using new screws from bag. Do not over tighten screws, the housing is aluminum and will strip out easily. Refer to the pictures below for reference.



Mount feet on both ends

Placement of Inverter

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For best operating results, the Inverter should be placed on a flat surface, such as the floor or seat of a vehicle. Approximately 20" of cord have been provided for this purpose. The inverter should only be used in locations that meet following requirements:

DRY - do not allow water to drip or splash on the Inverter.

COOL - ambient air temperature should be between 50 and 80 F. Do not place the Inverter on or near a heating vent or any piece of equipment, which is generating heat above room temperature. Do not place the Inverter in direct sunlight.

VENTILATED - allow at least one inch of clearance around the Inverter for airflow. Do not place items on or over the Inverter during operation. Make sure that air is allowed to circulate freely around the unit.

SAFE - do not use the Inverter near flammable materials or in any location which may accumulate flammable fumes or gases, such as the battery compartment of your car, truck, RV or boat.

Connecting to Power Source

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Connection can also be made directly to the vehicle's battery. In that case a 20 amp ATC fuse can be used (not supplied).

Electrical Connections

The Inverter comes with a cigarette lighter plug adapter for connection to the power source. The tip of the plug is positive and the side contact is negative. Connect the plug to the cigarette lighter socket by pushing in firmly to insure proper contact.

The majority of modern automobiles, RVs, and trucks are negative ground. Do not use the Inverter with positive ground vehicle electrical systems.

CAUTION: DO NOT USE WITH POSITIVE GROUND VEHICLE SYSTEMS.

CAUTION: CONNECT DIRECTLY TO POWER SOURCE WHEN OPERATING ABOVE 100 WATTS

Most cigarette lighter currents are fused between 10-15 amps. Thus, connection of the 150W Inverter using the cigarette lighter plug adapter is suitable for operating the inverter at power outputs up to approximately 100 watts.

If the inverter is to be used at power levels above 100 watts, direct connection to the power source is recommended using a hardwire connection.

TEMPORARY BATTERY CONNECTION

To make a direct connection, follow these steps:

CAUTION: THE ALLIGATOR CLAMPS COULD COME LOOSE WHILE DRIVING CAUSING POSSIBLE MECHANICAL/ELECTRICAL DAMAGE.

Convert the 12-volt car cord into a hard wired connection, by connecting a cigarette lighter socket to alligator clamps (not supplied) for temporary use (do not leave alligator clamps on when the vehicle is being driven).

Then, make a good connection to the power source terminals using alligator clips. Connect the Red clip to the Positive (+) terminal and the Black clip to the Negative (-) terminal.

PERMANENT BATTERY CONNECTION

For a permanent connection, use ring terminals of the appropriate size (one colored RED and one BLACK) (not supplied) in place of the alligator clamps. Observing correct polarity, connect the terminals to the battery termination posts.

A20 amp ATC fuse can be used in place of the 10 amp ATC fuse (not supplied) to increase the wattage available from the inverter.

CONNECTION TO LOAD

Once you have determined the proper method of connection to the power source (cigarette lighter or direct to battery with adapter socket), connect the 150W Inverter accordingly, making sure to fully insert the plug into the appropriate socket. Now plug appliance(s) into the receptacle(s) on the Inverter and flip the rocker switch to the (ON) position. The green LED above it and slightly to the right will illuminate. Turn on your appliance(s) making sure the load requirements are within the parameters of the Inverter's output

If an audible alarm sounds, that means the power input voltage is too low.

At 9.5V, the PROT (protection) indicator LED will illuminate to red and the inverter will automatically shut down.

CAUTION: DO NOT CONNECT TO AC DISTRIBUTION WIRING

The Inverter is designed to be directly connected to standard electrical and electronic equipment in the fashion described above. Do not connect the Inverter to household or RV AC distribution wiring. Do not connect the Inverter to any AC load circuit in which the neutral conductor is connected to ground or to the negative of the DC (battery) source.

CAUTION: RECHARGEABLE APPLIANCES

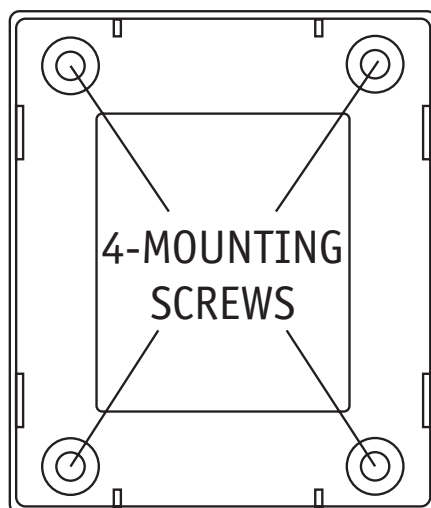
Certain rechargeable devices are designed to be plugged directly into an AC receptacle to be recharged. These devices may damage the Inverter. When first using a rechargeable device monitor its temperature for the first 10 minutes to ensure that it does not become abnormally hot. That will be your indication that it should not be used with this inverter.

This problem does not occur with the vast majority of battery operated equipment. Most equipment of this type uses a separate charger or transformer that is plugged into the AC receptacle. The Inverter should have no trouble powering these chargers and transformers.

Game Plate Installation

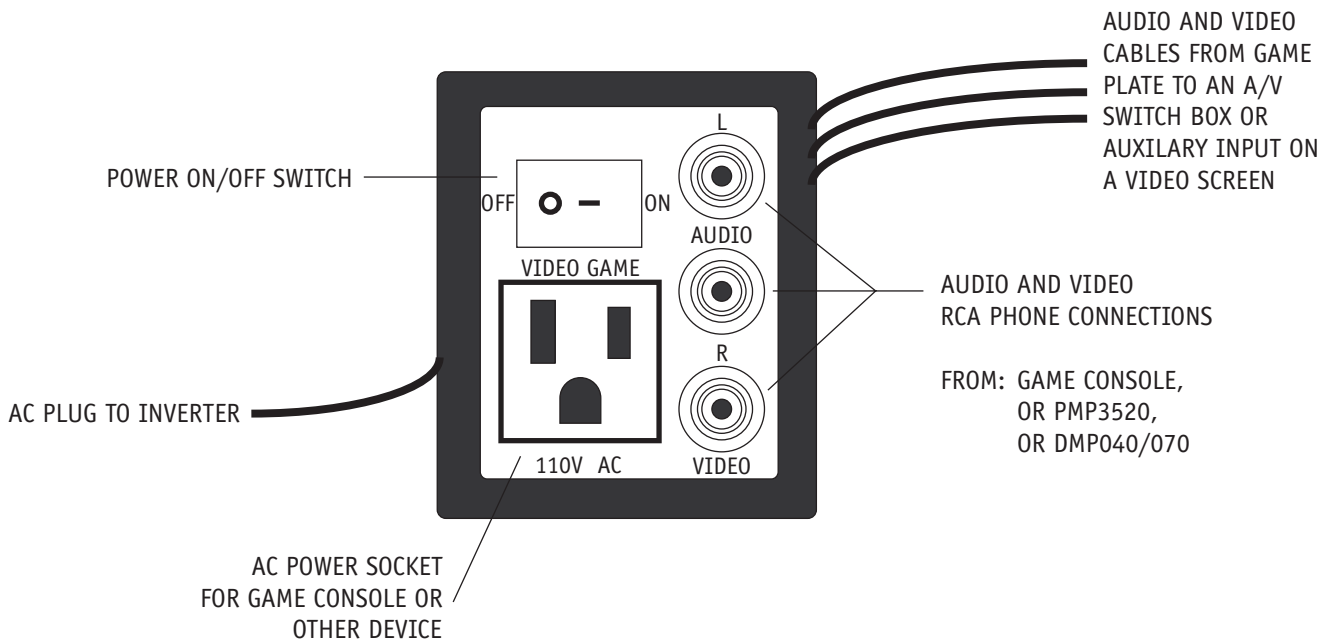
MOUNTING THE GAME PLATE

The front of the game plate snaps off to allow the back portion of the plate to be mounted in a convenient location in the vehicle (such as the back of the front-center seat arm rest). Make sure that the location you pick will allow the AC cord from the plate to reach the inverter.



TYPICAL CONNECTION DIAGRAM

The diagram below shows typical types of connections.



Fuse Replacement

Should the blade type 10-amp fuse in the inverter fuse socket blow, remove the plastic cover and replace with the spare fuse provided or equivalent. Determine the cause of the problem and remedy before attempting to use the unit again.

Operating Tips

RATED VERSUS ACTUAL CURRENT DRAW OF EQUIPMENT

Most electrical tools, appliances and audio/video equipment have a label indicating power consumption in amps or watts. Add up the power consumption of those items you will be using simultaneously, keeping the total below the rating of Inverter. If the power consumption is rated in amps, multiply by the AC voltage (115) to determine the wattage. For example, a power drill rated at 3.2 amps will draw 368 watts, more than the 150W Inverter can handle on a continuous basis.

Resistive loads are the easiest for the Inverter to drive, though larger resistive loads, such as electric stoves or heaters, usually require more wattage than the Inverter can deliver continuously. Inductive loads, such as TV 's and stereos (any device with a coil or transformer in it), by nature require more current to operate than a resistive load of the same wattage rating. Induction motors (motors without brushes), as well as some televisions, may require 2 to 6 times their wattage rating to start up. This condition may require repeated "ON OFF, ON OFF, ON OFF" switching of the power switch on your Inverter in order to get them "started".

The most demanding are those that start under load, i.e. compressors and pumps. Since motor and television characteristics vary widely, only testing will determine if a specific load can be started and how long it can be run. There are no standards for "surge power" partly because this specification cannot be represented accurately by a simple number.

Though the 150W Inverter can provide power up to 175 watts on a momentary basis, experimentation is the only means of determining whether it can handle the surges needed to start a particular load.

IMPORTANT NOTE: The 150W Inverter will not operate most appliances designed to produce heat, such as hair dryers, coffee makers, irons, heaters, and toasters. The current draw of most of these exceeds 1000 watts, far beyond the capacity of this unit.

BATTERY OPERATING TIME

With a typical vehicle battery, a minimum operating time of 1 to 2 hours can be expected between recharging, depending on the current draw of the load being driven. We recommend that the operator start the vehicle every hour to recharge the battery system. This will prevent any unexpected shutdowns of the equipment and will ensure that there is always sufficient battery capacity to start the vehicle engine.

The inverter may be used either while the engine is running or turned off. However, the Inverter may not operate while the engine is being started since the battery voltage can drop substantially during cranking.

The Inverter draws less than 0.2 amperes from the battery when it is not supplying power to a load. In most cases the 150W Inverter may be left connected to the battery for up to 3 hours when it is not in use since it draws so little current. If the vehicle will not be used for several days, disconnect the Inverter from the battery.

CAUTION: LOW BATTERY ALARM

An alarm will sound when the voltage from the battery drops to 10.2 volts. This indicates that the battery requires recharging. The user should stop operations at this time since the Inverter AC will shut down automatically shortly afterwards (when battery voltage drops to 9.5 volts)

NOTE: The alarm may sound momentarily when the unit is being connected to, or disconnected from, the power source. This is normal and does not indicate any problem.

Troubleshooting

AUTOMATIC PROTECTIVE FEATURES OF THE INVERTER

Your Inverter circuitry constantly monitors the following potentially hazardous conditions:

- a) **Low Battery Voltage** - This condition is not harmful to the inverter but could damage the power source. An audible alarm is sounded when input voltage drops to 10.2 volts and the inverter shut down when input voltage drops to 9.5 volts. When the condition is corrected (i.e. alternator charges battery) the unit may be restarted.
- b) **Over Voltage Protection** - The inverter will automatically shut down when the input voltage exceeds 15 ± 0.3 volts DC.
- c) **Overload Protection** - the inverter will automatically shut down when the continuous draw exceeds 300 watts.
- d) **Thermal Protection** - When the temperature of the internal heat sinks reaches 150°F , the solid-state temperature sensor located in the inverter will automatically shut down the unit. The unit may be "restarted" by turning the unit OFF and then ON again after approximately 15 minutes of cool down.

Common Problems

Televisions will not start, power tools will start but will not continue to run.

Certain induction motors (motors without brushes) may require two to six times their wattage ratings to start up. If the power tool runs momentarily then stops when power is applied, try leaving the power to the tool "on" while quickly turning the power switch on the Inverter on and off.

Buzz in audio systems

Some inexpensive stereo systems and "boom boxes" will emit a buzzing sound from their loudspeakers when operated from the Inverter. This is because the power supply in the device does not adequately filter the modified sine wave produced by the Inverter. The only solution is to use a sound system that incorporates a higher quality power supply.

Television interference

The Inverter is shielded and filtered to minimize interference with TV signals. In some cases, particularly with weak TV signals, some interference may still be visible. Try the following corrective measures:

- a) Position the Inverter as far as possible from the television, the antenna and the antenna cables.
- b) Adjust the orientation of the Inverter, the antenna cables, and the TV power cord to minimize interference.
- c) Make sure that the antenna feeding the television provides an adequate ("snow free") signal and that high quality, shielded antenna cable is used.

Troubleshooting Guide

PROBLEM: LACK OF POWER OUTPUT

Possible causes

- Inverter not adequately warmed up
- Automotive system requires ignition to be on
- Battery voltage below 9.5 volts
- Equipment being operated draws too much power
- Inverter in thermal shutdown condition

- The alligator clips of the hard wire adapter are connected incorrectly to the battery terminals.

Suggested remedy

- Some types of loads will not allow the inverter to turn on. These type of loads are inductive (an example would be a fan). Turn the Inverter power switch off and unplug the load(s) from the inverter then turn the inverter On. Now connect the load(s).
- Turn Inverter power switch off and then on again until the Inverter powers your appliance. Repeat as necessary to get your appliance "started".
- Turn ignition to accessory position.
- Recharge or replace battery.
- Reduce load to maximum 100 watts.
- Allow Inverter to cool down. Ensure there is ventilation around unit. Ensure that load is no more than 100 watts for continuous operation.
- Replace fuse with a new 10 Amp fuse (blade type), then ensure that the red clip is connected to the positive terminal and the black clip to the negative terminal.

PROBLEM: LOW OUTPUT VOLTAGE

Possible causes

- Using average-reading voltmeter.
- Inverter is overloaded.
- Input voltage below 9.5 volts.

Suggested remedy

Use true RMS reading meter for the following:

- Reduce load to a maximum of 100 watts to maintain regulation.
- Keep input voltage above 9.5 volts to maintain regulation.

PROBLEM: LOW BATTERY ALARM ON ALL THE TIME

Possible causes

- Poor battery condition.
- Inadequate input power or excessive load.

Suggested remedy

- Replace battery.
- Check the voltage at the cigarette lighter plug and socket. Clean or replace as necessary to correct for low voltage.

Specifications

Max. Continuous Power	150 Watt
No Load Current Draw	less than 0.2Amp
Wave form	Modified Sine Wave
Input Voltage Range	9.5 to 15 (± 0.3)VDC
AC Receptacles	Dual 3 -Prong
Fuse	10 Amp (Blade Type)
Dimensions	5.2" L x 4.1" W x 2.2" H

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